Section II (Remarks)

Request for Continued Examination; Petition for Extension of Time (37 CFR 1.136)

Enclosed and submitted herewith is a Request for Continued Examination Transmittal (Form PTO/SB/30).

As indicated in the introductory portion of this response, payment of the $810.00 Request for Continued Examination fee specified in 37 CFR 1.17(e) is included in the amount of $1,270.00 authorized in the enclosed Credit Card Payment Form PTO-2038. This amount of $1270 also includes the fee of $460 specified in 37 CFR 1.17(a) for the two months extension of time requested herein under the provisions of 37 CFR 1.136 for reply to the June 26, 2007 Office Action.

Authorization is also hereby given to charge the amount of any additional fee or amount properly payable in connection with the entry of this response and the accompanying RCE, to Deposit Account No. 08-3284 of Intellectual Property/Technology Law.

Status of Claims in the Application

Claims 1-17 and 25-69 are pending in the application. Claims 1-17, 25-30, 39-42 and 53-69 have been withdrawn. Claims 31-38 and 43-52 have been examined and are under consideration.

Rejection of Claims in the June 26, 2007 Office Action, and Traversal Thereof

The following rejections of claims have been made in the June 26, 2007 Office Action:

- a rejection of claims 31-36, 44, 49, 50 and 52 under 35 USC 103(a) as unpatentable over Stevenson et al. U.S. Patent 3,819,974 ("Stevenson") in view of Kitagawa et al. U.S. Patent 5,237,182 ("Kitagawa") or Tadamoto et al. U.S. Patent 5,770,887 ("Tadamoto");
- a rejection of claims 37-38, 45-46 and 51 under 35 USC 103(a) as unpatentable over Stevenson in view of Kitagawa or Tadamoto, and further in view of Ditzik;

- a rejection of claims 43 and 47-48 under USC 103(a) as unpatentable over Stevenson in view of Kitagawa or Tadamoto, further in view of alleged Applicant Admitted Prior Art (AAPA).

These rejections are traversed and reconsideration of the patentability of such claims is requested in light of the following remarks.

Arguments for Patentability of Claims 31-38 and 43-52 Over the Cited References

Rejection of Claims 31-36, 44, 49, 50 and 52 - Stevenson in view of Kitagawa or Tadamoto

Stevenson discloses a LED and a phosphor, in which the LED produces violet light (column 1, lines 10-12 of Stevenson - "[T]his invention relates generally to light emitting diodes and more particularly a violet light emitting diode"). See also column 1, lines 26-27 of Stevenson ("[I]t is a general object of the present invention to provide a violet light emitting diode.")

To achieve such light emitting diode emission, Stevenson teaches a structure including a sapphire substrate having deposited thereon a layer of n-type gallium nitride, on which has been deposited a magnesium-doped gallium nitride layer to compensate the n-type material and form a substantially intrinsic GaN:Mg layer forming an i-n junction with the n-type gallium nitride layer. Leads are connected to the magnesium-doped gallium nitride layer and to the n-type gallium nitride layer, to constitute the structure as shown in FIG. 3 of the Stevenson reference.

The Stevenson reference discloses that this structure when powered in a forward bias mode will produce violet light, and that under reverse bias conditions, greenish light can be produced (see column 2, lines 55-64 of Stevenson).

In the paragraph bridging columns 3 and 4 of Stevenson, it is disclosed that:

> "... there has been provided an improved light emitting diode capable of emitting light in the violet region of the spectrum. This device may be used as a source of violet light for applications where this spectral range is appropriate. This light maybe converted to lower frequencies (lower energy) with good conversion efficiency using organic and inorganic phosphors. Such a conversion is appropriate to develop different colors for aesthetic purposes, but also to produce light in a spectral range of greater sensitivity for the human eye. By use of different phosphors, **all the primary colors may be developed** from this

> same basic device. An **<u>array of such devices may be used for color display systems</u>**: for example, a solid state TV screen."

This discussion of developing "different colors" or "light in a spectral range of greater sensitivity for the human eye" or "primary colors" is <u>not</u> a disclosure of "a white light output" as required by all of applicants' claims.

The examiner concedes this – he acknowledges that "the prior art does not specially disclose the 'white light' limitation" (page 4 of the June 26, 2007 Office Action), but then contends that "this feature is either inherent or obvious because the phosphor disclosed by Stevenson and in combination with Kitagawa and/or Tadamoto is substantially identical to that of the claims, <u>claimed properties or functions are presumed to be inherent</u>."

There is no basis for the "substantially identical" contention, since **<u>Stevenson does not anywhere identify the phosphor</u>**. Further, **the phosphor of Stevenson cannot be identical, since it does not produce a "white light output."** This is apparent from the disclosure in Stevenson that

> "[B]y use of <u>different phosphors, all the primary colors may be developed</u> from this same basic device. An <u>array of such devices may be used for color display systems</u>: for example, a solid state TV screen."

Stevenson therefore contemplates an array of devices, each of which produces a primary color (red, green and blue are the primary colors), to constitute an RGB array. There is no white light output. The disclosure of "different colors" and "primary colors" is a disclosure of single colors, not a white light output.

Accordingly, even if one were to replace the violet LED of Stevenson with a blue/UV LED of Kitagawa or Tadamoto, **<u>one still would not alter the fact that the resulting output would be a single color output</u>**, since Stevenson uses a phosphor that produces a single color, such as red, or green, or blue, as expressly taught ("primary colors") by Stevenson.

Since all of applicants' claims require a "white light output" and Stevenson in view of Kitagawa or Tadamoto provides no basis for a "white light output," there can be no obviousness of applicants' claimed invention, and the rejection of the claims 31-36, 44, 49, 50 and 52 should be withdrawn on such grounds.

In his analysis at page 3 of the June 26, 2007 Office Action, the examiner states that Stevenson discloses a display including at least one light emission device, wherein each light emission device comprises an LED energizable to emit violet radiation, and a luminophoric medium.

The examiner then states, "But, Stevenson does not disclose the LED emits radiation in the blue to ultraviolet spectrum" (page 4 of the June 26, 2007 Office Action). This statement, however, mischaracterizes the reference. Violet light is in the "blue to ultraviolet spectrum." Violet light has a wavelength of "approximately 380–420 nm when indigo is recognized, or more commonly 380–450 nm" (see Wikipedia, http://en.wikipedia.org/wiki/Violet_%28color%29, visited November 19, 2007). Blue light has a wavelength of "roughly 440–490 nm" (see Wikipedia, http://en.wikipedia.org/wiki/Blue, visited November 19, 2007). Ultraviolet radiation has a wavelength, including near UV to deep UV, of 1-400 nm (see Wikipedia, http://en.wikipedia.org/wiki/Ultraviolet, visited November 19, 2007). The blue to UV spectrum therefore has a wavelength of from 490 nm to 1 nm. This includes the violet spectrum.

The Stevenson reference therefore has been misconstrued, as a basis for the rejection of applicants' claims. This threshold misconstruction of Stevenson is further compounded by additional misconstruction of the Stevenson reference, as discussed below.

Kitagawa and Tadamoto have each been cited as disclosing an LED emitting in the blue to ultraviolet spectrum.

The examiner then has contended that "it would have been obvious to one of ordinary skill in the art to use the LED teaching of Kitagawa or Tadamoto in Stevenson's device, because it would have provided a LED having good and efficient emitting radiation in the blue to ultraviolet spectrum as taught by Kitagawa ... and Tadamoto" (page 4, June 26, 2007 Office Action).

The examiner's basis for importing Kitagawa or Tadamoto – "because it would have provided a LED having good and efficient emitting radiation in the blue to ultraviolet spectrum" – therefore is in error, since Stevenson already discloses an LED "emitting radiation in the blue to ultraviolet spectrum," namely, in the emission of violet light. There is accordingly no basis for importing Kitagawa or Tadamoto, and the rejection is deficient on such additional ground.

The foregoing errors of construction underlying the examiner's rejection of applicants' claims is further compounded by the examiner's additional misconstruction of Stevenson to attribute elements to such reference that are in no way present therein.

Specifically, the examiner has stated at page 4 of the August 24, 2007 Office Action:

> **"Although the prior art does not specially disclose the 'white light' limitation, this feature is seen to be either inherent or obvious because the combination of Stevenson and Kitagawa and/or Tadamoto is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent. Or where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. In re Best, 195 USPQ 430, 433 (CCPA 1977) and MPEP 2112.01. Furthermore, the inorganic phosphor converting the UV light to white light is well known as discussed in the specification on page 6 by the Applicant"**

The examiner's statement is syntactically complex, and requires deconvolution. Taking such statement in a sentence-by-sentence manner for analysis, the further misconstruction of the primary Stevenson reference is apparent.

Examiner's statement: "Although the prior art does not specially disclose the 'white light' limitation, this feature is seen to be either inherent or obvious because the combination of Stevenson and Kitagawa and/or Tadamoto is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent."

Response: The applicants' broad claim 31 recites a display that includes, *inter alia*, "a luminophoric medium arranged to be impinged by radiation emitted from the LED and to responsively emit radiation in a range of wavelengths, so that radiation is emitted from the light emission device as a white light output." This language requires the luminophoric medium to be a material that responds to impinged LED radiation by emitting its own radiation, to enable the light emission assembly to produce a white light output. No such material is described by Stevenson.

Applicants have previously introduced evidence into the record of this application (Declaration of Bruce Baretz under 37 CFR 1.132, filed May 29, 2007) of the meaning of the disclosure of Stevenson. The Baretz Declaration states in reference to Stevenson et al.:

"8. THAT U.S. Patent 3,819,974 (Stevenson et al.) was issued on June 25, 1974, and contains the following disclosure at column 3, line 24 to column 4, line 7:

> **"Thus, it is seen that there has been provided and improved light emitting diode capable of emitting light in the violet region of the spectrum. This device may be used as a source of violet light for applications where this spectral range is appropriate. This light may be converted to lower frequencies (lower energy) with good conversion efficiency using organic and inorganic phosphors. Such a conversion is appropriate not only to develop different colors for aesthetic purposes, but also to produce light in a spectral range of greater sensitivity for the human eye. By use of different phosphors, all the primary colors may be developed from this same basic device. An array of such devices may be used for color display systems; for example, a solid state TV screen."**

9. THAT the disclosure in U.S. Patent 3,819,974 (Stevenson et al.) quoted in paragraph 8 hereof describes the production of light of specific discrete colors, including the production of violet light, and the production of primary colors; that primary colors are red, green and blue; that there is no disclosure in U.S. Patent 3,819,974 (Stevenson et al.) of generating polychromatic white light; and that there is no disclosure in U.S. Patent 3,819,974 (Stevenson et al.) of any phosphor materials that would produce polychromatic white light in response to violet light emitted by the disclosed light emitting diode.

10. THAT the disclosure of U.S. Patent 3,819,974 (Stevenson et al.) quoted in paragraph 8 hereof, referring to conversion of violet light using phosphors "not only to develop different colors for aesthetic purposes, but also to produce light in a spectral range of greater sensitivity for the human eye" thereby refers to single discrete colors of light and light of a single color, consistent with the state of the art and conventional wisdom that is described in paragraph 5 hereof and applicable to the interpretation of U.S. Patent 3,819,974 (Stevenson et al.) as of the time the Invention was made by Dr. Tischler and me.

11. THAT the disclosure of U.S. Patent 3,819,974 (Stevenson et al.) quoted in paragraph 8 hereof, stating that "all the primary colors may be developed from this same basic device" and thereafter stating that "[A]n array of such devices may be used for color display systems; for example, a solid state TV screen" refers to an array of LED/phosphor devices in which each such device produces one of the primary colors of red, blue and green, consistent with the state of the art and conventional wisdom that is described in paragraph 5 hereof and applicable to the interpretation of U.S. Patent 3,819,974 (Stevenson et al.) as of the time the Invention was made by Dr. Tischler and me."

On the basis of this evidence of record, Stevenson's disclosed device is not substantially identical to applicants' claimed invention, because Stevenson discloses a single color output device. As such, Stevenson **teaches away** from producing white light (which is a combination of multiple colors) from a light emission device.

Concerning the examiner's statement in reference to Stevenson that "claimed properties or functions are presumed to be inherent," the legal criteria for inherency are well-established and the facts here do not support the examiner's contention that Stevenson inherently produces a white light output. The MPEP in Section 2112 states that:

> **"The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) ... "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.' " *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citations omitted) ...**
>
> **"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original)"**

The standard therefore is clear – for applicants' claimed invention to be "inherent" in Stevenson's disclosure, (1) Stevenson's disclosed device must necessarily produce a white light output and (2) persons of ordinary skill must recognize that Stevenson's disclosed device would necessarily produce such a white light output.

Concerning requirement (1) that Stevenson's disclosed device must necessarily produce a white light output, Stevenson contains no disclosure of any suitable material for the phosphor. Phosphors are transition metal compounds or rare earth compounds, typically made from a suitable host material to which an activator has been added. Potential host materials include oxides, sulfides, selenides, halides or silicates of zinc, cadmium, manganese, aluminum, silicon, or various rare earth metals. Myriad activator species exist, and the permutations of compositional variations are potentially infinite, with each specific phosphor composition having its own excitation, emission, quenching, decay, intensity and other performance characteristics. (See Wikipedia, at http://en.wikipedia.org/wiki/Phosphor, visited November 19, 2007). Given this circumstance, and the total absence of any identification of any specific phosphor, and the specific teaching of Stevenson to produce single colors, there is in fact nothing from which it can be concluded that a white light output would necessarily be produced by Stevenson's device.

Concerning requirement (2) that persons of ordinary skill must recognize that Stevenson's disclosed device would necessarily produce such a white light output, applicants have presented evidence in the Baretz declaration that one would view Stevenson:

- as describing production of light of specific single discrete colors, including production of violet light, and production of primary colors;
- as lacking any disclosure of generating a white light output;
- as lacking disclosure of any phosphor materials that would produce a white light output in response to violet light emitted by the disclosed light emitting diode;

- as referring to separate devices for producing each of primary colors of red, blue and green, in arrays for color display systems such as solid state TV screens.

Examiner's statement: "Or where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established."

Response: The Stevenson device is not identical or substantially identical in structure or composition, since in fact no LED/phosphor device structure has been disclosed in Stevenson. The only device structure that is shown and described in Stevenson is that of FIGS. 1-3 of such reference, which contains only a light emitting diode, and no phosphor material of any kind. See, for example, FIG. 3 of Stevenson, reproduced below

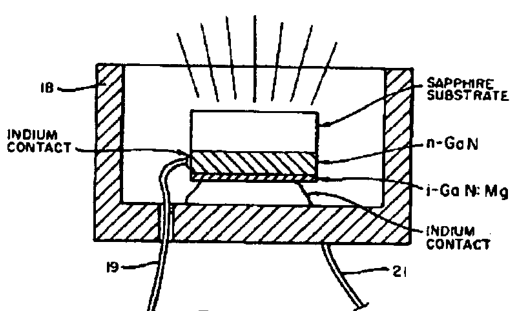

FIG. 3

in which the gallium nitride and sapphire layers constitute the device structure in a cup-shaped metal holder. There is no phosphor in this structure, and in fact Stevenson contains no disclosure of any type as to how one might fabricate a structure including an LED and a phosphor.

Given the absence of any specific guidance or description that would address the physical arrangement or how an LED/phosphor device might be fabricated, there is simply no basis in Stevenson for making the assertion in the examiner's statement that "the claimed and prior art products are identical or substantially identical in structure," for the plain and simple reason that no relevant structure is disclosed in Stevenson.

Likewise, as pointed out above, Stevenson contains no disclosure whatsoever of any phosphor composition. There is accordingly no basis in Stevenson for making the assertion in the examiner's

statement that "the claimed and prior art products are identical or substantially identical in ...composition."

Stevenson as noted above does not contain any disclosure about fabrication of an LED/phosphor device, and the only structures and manufactured devices addressed in such reference are LED device structures, containing no phosphor material or components. There is therefore no basis in Stevenson for making the assertion in the examiner's statement that "the claimed and prior art products are ... produced by identical or substantially identical processes."

It therefore is apparent that no *prima facie* case of anticipation or obviousness has been established, since the grounds advanced by the examiner failed to provide any basis in Stevenson for producing a white light output, and the reason advanced by the examiner for importing Kitagawa or Tadamoto has been shown to be without basis, since it is premised on misconstruction of the Stevenson primary reference.

The examiner has stated at page 4 of the August 24, 2007 Office Action that "[F]urthermore, the inorganic phosphor converting the UV light to white light is well known as discussed in the specification on page 6 by the Applicant." This statement has reference to the background section of applicants' present application, discussing fluorescent lamp technology, in which mercury vapor in the vacuum tube is excited by an electrical discharge, and inorganic phosphors coat the inside walls of the vacuum tube. The examiner has failed to mention the mercury vapor electrical discharge device that is described in paragraph [0011] of applicants' specification, and the plain and simple fact is that mercury vapor discharge devices are not LEDs. As applicants point out in the same paragraph [0011], such mercury vapor discharge devices "are not solid-state, and [their] miniaturization... has never been practically accomplished." There is accordingly no basis in the mere existence of mercury vapor discharge lamps for applicants' claimed invention.

Applicants' broad claim 31 has been shown by the foregoing discussion to be fully patentably delineated over Stevenson, and the hypothetical combination of Stevenson with Kitagawa or Tadamoto has been shown to be without substantive technical merit due to the misconstruction of Stevenson relied on as a basis for importing Kitagawa and Tadamoto.

The remaining claims 32-36, 44, 49, 50 and 52 rejected on the basis of Stevenson in view of Kitagawa or Tadamoto are also patentably delineated over such references on the same basis, since they either depend from or otherwise incorporate the same limitations as claim 31.

For all the foregoing reasons, it is requested that the rejection of claims 1-4, 8, 13 and 14, 17 and 24 based on the Stevenson in view of Kitagawa or Tadamoto be withdrawn.

Rejection of Claims 37-38, 45-46 and 51 - Stevenson in view of Kitagawa or Tadamoto, in view of Ditzik

Ditzik has been cited for combination with Stevenson in view of Kitagawa or Tadamoto, as applied to claim 31.

Ditzik has specifically been cited as disclosing a liquid crystal display or a backlight display including a plurality of LED, the examiner noting column 3, line 4, and contending that at the time the invention was made, it would have been obvious to one of ordinary skill to use the teaching of Ditzik with Stevenson, "because LED can be used as a light source for LCD or backlight for intended use.

Ditzik at column 2, line 66 to column 3, line 13 discloses

> "Certain flat panel display devices, such as Liquid Crystal Displays (LCD), may require a backlight for better viewability. A number a [sic] backlight technologies are known to provide a relatively uniform light to the back of display panels. Prior art in backlights include electro luminescent, ***fluorescent, incandescent, and LED light sources. A number*** of light guide devices have been used to apply light to the rear of the display panel, using various fiber, glass, and plastic optical guides. However, several problems arise when the display must be viewed under sunlight, twilight, or night conditions. Each of these viewing conditions require different backlighting designs. The new multiple backlight invention described herein solves these problems by providing a simple way of using multiple light sources and integrating their light to the rear of an LCD panel."
>
> (Ditzik, column 2, line 66 – column 3, line 13; emphasis added)

This passage in its entirety simply mentions LED light sources as one of a variety of types of light sources (including electroluminescent, fluorescent, and incandescent) used in the prior art.

There is no elaboration of the structure, composition, operating characteristics or any other information or detail relating to what "LED light sources" is or embodies. Further, this passage after mentioning each of these types notes their deficiency in not accommodating varied light conditions ("several problems arise when the display must be viewed under sunlight, twilight, or night conditions").

The solution of Ditzik to this problem is a switchable system in which the user can select one or more of multiple light sources to adjust to a specific ambient lighting condition. Ditzik therefore requires provision of a multiplicity of types of light sources in order to provide the desired flexibility for viewing the LCD under varied ambient light conditions.

The question then becomes, given that Stevenson discloses "[A]n array" of single color light devices "for color display systems," as primary color (red, green, blue) devices, without any disclosure of the need for backlighting of such display, how and why would one, *a priori*, attempt any synthesis of Stevenson or Stevenson/Kitagawa with the LCD teachings of Ditzik?

The references themselves do not provide any clue as to how the single light color devices of Stevenson could be applied or implemented in a backlighting system of Ditzik. There is simply no specificity or guidance in any of the Stevenson, Kitagawa, Tadamoto or Ditzik references to provide any basis or logic for combination. There is no apparent way in which the Stevenson, Kitagawa, Tadamoto and Ditzik references can be combined to yield a display in which "radiation is emitted from the [LED/phosphor] light emission device as a white light output," as required by applicants' broad claim 31, from which claims 37 and 38 depend, or independent claim 44 (wherein "radiation is emitted from the light emitter as a white light output"), from which claims 45-46 and 51 are directly or indirectly dependent.

Accordingly, claims 37-38, 45-46 and 51 are patentably delineated over the cited references for the same reasons as advanced above in support of the patentable distinction of claim 31 and claim 44 over the cited references.

It is correspondingly requested that the rejection of claims 37-38, 45-46 and 51 be withdrawn.

Rejection of Claims 43 and 47-48 - Stevenson in view of Kitagawa or Tadamoto, in view of AAPA

Claims 43 and 47-48 have been rejected over Stevenson in view of Kitagawa or Tadamoto, as applied to claim 31, further in view of alleged applicant "admitted" prior art (AAPA).

The reference made in the Office Action to AAPA identifies specification pages 11-12 as describing a material responsively emitting at least in the green, yellow spectrum. The text of pages 11-12 is set out below.

> **"[0021] Japanese Patent Publication 04289691 of Mitsubishi Cable Industries, Ltd., published Oct. 14, 1992, discloses an electroluminescent device comprising a fluorescent dye-fixed silica layer coated with a transparent electrode layer, a luminescing (light-emitting) layer containing a phosphor, a backside electrode layer, a water-sorbing layer, an encapsulating film, and an insulating layer.**
>
> **[0022] In the Mitsubishi patent publication, the silica layer may be formed by a sol gel process using metal alkoxides in a solvent such as ethanol, isopropanol, or dimethyl ether. A Rhodamine 6G-doped silica layer is described to exhibit white luminescence. The luminescing layer may be for example on the order of 15 microns in thickness, and is formed by a sol gel technique yielding ZnS or ZnCdS doped with a dopant such as copper, aluminum, manganese, chlorine, boron, yttrium, or rare earth dopant. The luminescing layer may also contain scattered phosphor material. The average grain size of grains in the luminescing layer is generally greater than 10 microns, and preferably is in the range of from 15 to 40 microns. The luminescing layer may for example contain from 30 to 80% phosphor. A disclosed advantage of the foregoing structure is that one can change the phosphor in the luminescing layer, and thereby change the color of the whole material.**
>
> **[0023] Japanese Patent Publication 60170194 of Sony Corporation, published Sep. 3, 1985, discloses a white light-emitting electroluminescent device with a luminescent layer containing a mixture of a blue-green-emitting phosphor and Rhodamine S. Since Rhodamine S strongly fluoresces orange by excitation with a bluish-green light, a white light of high luminosity may be obtained even at low voltage. This reference discloses a phosphor emitting blue-green light, in which ZnS is doped with Cu and Cl, as well as a phosphor emitting yellow light, in which ZnS is doped with Cu and Mn. ZnS may also be doped with Cu and Br to produce green light.**
>
> **[0024] The Sony patent publication discloses a multilayer electroluminescent article, including sealing layers of protective film of a**

material such as Aclar polymer, a polyester layer, a transparent electrode formed of indium tin oxide (ITO), a light-emitting layer, and a backside electrode. The light-emitting layer may comprise 50-95% by weight of ZnS doped with the aforementioned dopant species (e.g., 0.045% wt. Cu, and 0.020% wt. Cl) and 5-50% wt. Rhodamine S.

[0025] Not withstanding the progress made in using organic fluorescers as luminescent sites within either electron-transport or hole-transport layers and affording thin-film interfacial hole-electron recombination, the current state of the art finds it difficult to generate organic based LED dies with reasonable operational lifetimes. By their very nature, these donor-acceptor complexes are prone to reaction with the surrounding medium. As a result, many of these organic molecules degrade under constant excitation to the excited state and consequently the organic-based LEDs fail. Those fluorescers with extremely high quantum yields of fluorescence, which by definition necessitate short excited state lifetimes and are unlikely to be quenched or degraded by oxygen or other reactants, do not have sufficient electron or hole transport properties to allow for device-wide localized hole-electron recombination in the ground state. However, their proximity to the holes, as dopants in a hole transporting layer, as an example, may make the excited states of the luminophors more easily oxidized than would normally be the case. This would be especially true for excited state species, even if the ground state of the luminophors are stable to the holes in the hole-transporting layer. Similarly arguments regarding excited state reduction would be applicable for dopants sequestered within an electron-transport layer."

There is no basis for extracting any of the foregoing into the Stevenson/Kitagawa/Tadamoto combination, and there is no tenable basis for deriving the instant invention from Stevenson/Kitagawa/Tadamoto/pages 11-12. In connection with the lack of basis for the applicants' claimed invention in Stevenson/Kitagawa/Tadamoto/pages 11-12, it is noted that claim 43 is dependent from claim 31 and claims 47-48 are dependent from claim 44, and such dependent claims 43 and 47-48 are patentably delineated over the cited references for the same reasons as advanced above in support of the patentable distinction of claim 31 and claim 44 over the prior art.

In addition to the foregoing showing of patentable distinction of applicants' claims 31-38 and 43-52, the patentability of such claims is further shown by the secondary evidence of patentability, described below.

Secondary Evidence of Patentability

<u>Significant secondary considerations provide compelling evidence of the non-obviousness of the invention.</u>

As stated in *Graham v. John Deere Co.*, 383 U.S. 1, 26 (1966):

> **Such secondary considerations as *commercial success, long felt but unsolved needs, failure of others*, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy. *Graham v. John Deere Co.*, 383 U.S. 1, 26 (1966) (emphasis added).**

As becomes clear from the following – all of the *Graham* secondary considerations (commercial success, long felt but unsolved needs, and failure of others) show the nonobviousness of the invention.

Inclusion of secondary considerations in the obviousness assessment is mandatory:

> **[E]vidence rising out of the so-called "secondary considerations" must *always* when present be considered en route to a determination of obviousness. . . . Indeed, evidence of secondary considerations *may often be the most probative and cogent evidence in the record*. It may often establish that an invention appearing to have been obvious in light of the prior art was not. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983) (emphasis added).**

<u>Long Felt But Unsolved Need</u>

The application describes generally the advantages of LEDs over other light sources such as incandescent bulbs. See Application, pg.1-4. In particular, LEDs are uniquely suited for many informational displays, e.g., commercial bank "time and temperature" message boards, stadium scoreboards, highway-mounted and portable vehicular control and information displays, "moving arrow" and other dynamically patterned lights on signs for hotels and casinos, etc.:

> **The practical advantages of LED displays over those using incandescent bulbs are many. The operational lifetime (in this case, defined as continual illumination) of a LED is on the order of 10 years or over 50,000 hours, whereas incandescent bulbs often burn out in the order of 2000 hours, thus leaving an empty pixel in the display message. Such recurrent failures make a display unreadable and, therefore, not useful. These conditions (i e, broken or missing pixels) require constant repair leading to a significant maintenance problem for providers of display signs based on incandescent illumination devices. With the long operational lifetime of a LED-based sign board, the pixels rarely burn out and the illuminated message remains legible over long operational periods.**

> **Similarly, LED lamps are considerably more robust. When exposed to stress, mechanical shocks, or temperature variations often encountered in an outdoor environment they are less likely to fail than incandescent lamps. . . . The solid state LED has no filaments to break and is housed within a durable plastic chamber, as the primary device envelope or package (typically being of considerable thickness), thereby exhibiting a high level of imperviousness to extreme outdoor environmental stresses.**
>
> Application, pp. 3-4.

Replacement of incandescent bulbs with LEDs in many of the aforementioned sign boards, however, is only practical if the LED emits **white light**. Conventional solid-state LEDs emit only single colors of light (e.g., red, amber, yellow-green, blue, etc).

As is demonstrated to every elementary school child in basic science by prismatically separating white light into its component spectral colors, white light is made up of a mixture of colors.

It is precisely this fact that was at the heart of the dilemma faced by the art, and unresolved until the applicants' inventive breakthrough – since white light is a mixture of colors, and LEDs only emit light of one color, how can white light, this mixture of many colors, be produced from a single LED?

The art had *no* answer to this question; its only solution for white light production from LEDs was to combine three different diodes. As a consequence, 3-element RGB (red, green, and blue) LED arrays – so-called "triplets" – came into the commercial arena, as products of companies such as Siemens Aktiengesellschaft in Germany and Ledtronics Inc. and Lumex Opto/Components in the United States. These products are still conventional and commercially available.

<u>Failure of Others</u>

Parallel to the development of "triplet" LEDs, another class of materials technology had been incubating in a half-dozen or more labs in the world – **organic light-emitting materials – that dated back to work in England in the early 1970s on conducting polymers and work at the University of Pennsylvania in 1977 on "synthetic metals."** Spurred by this work, many researchers joined the race to find new materials for use as conducting and semiconducting plastics.

Between 1987 and 1989 several researchers found that these materials could be made to emit light when doped properly and energized with a current. Lured by the vision of using cheaply manufacturable organic materials for light emission in the ultimate device – a light-emitting, low voltage, full color, monolithic electronic display – a number of major corporations and start-up companies mounted substantial R&D efforts.

Hundreds of millions of dollars were poured into the effort. The optimism that characterized the early efforts disappeared as the initial prototype organic light-emitting devices were tested, and researchers found that **device times to failure were measured in months and even shorter operating lives were achieved when the devices were integrated into multi-device displays.**

The initial dreams of early success were replaced by a more pragmatic focus on longer term development. Degradation of the organic material and short operating lifetimes continue to plague the efforts. **There are still to the present day no commercial long-life light-emitting organic devices of significance, despite the prior efforts and expended resources of companies such as Cambridge Display Technology (Cambridge, England), Eastman Kodak (Rochester, NY), Uniax Corporation (Santa Barbara, CA), and Pioneer, TDK and Idemitsu Kosan in Japan.**

<u>Commercial Success and Scientific Recognition</u>

Against this background of failure of the art to achieve white light emission from a single LED, and failure of the art to achieve an organic light emitting material of any commercially viable character, **applicants in 1995 made a remarkable breakthrough - the invention of a single LED device for the production of white light. It was not until *two years later*, in 1997, that the *same* discovery was made by others – Nichia in Japan and Fraunhofer Institute in Germany – and hailed as a remarkable advance in the art.** Fraunhofer's publicity on the World Wide Web reported the news of the development (Fraunhofer-Gesellschaft: Research News Special 1997, at <u>http://www.fhg.de/press/md-e/md1997/sondert2.htm</u>, which stated:

> **"In contrast to the fragile and shortlived light bulb, lightemitting [sic] diodes, or for short [abbreviation] LEDs, are small, robust and highly efficient. LEDs are based on semiconductor chips which convert an electric current directly into light. A current of a few milliamps is sufficient to generate light resulting in a low power consumption. LEDs are cheap and have a lifetime of about 100,000 hours, or i.e. they emit light at a constant intensity for 11 years when operated 24 hours a day. Because of these advantages they have already found many applications in e.g., traffic lights, dashboards and as indicator lights in consumer electronics wherever**

> **replacement is cumbersome and expensive. Red, yellow, and yellowgreenish [sic] emitting LEDs have already been on the market for a long time, while blue and green emitting LEDs became commercially available only three years ago. <u>By combining red, green, and blue emitting diodes, the generation of white light became possible. However, the emission of white light by a single chip LED was still impossible</u>.**
>
> **This problem was solved by a research team at the Fraunhofer-Institut fur Angewandte Festkorperphysik IAF in Freiberg (Germany) and, at the same time, by their colleagues at Nichia Chemical Industries in Japan. <u>Their innovative idea was to generate white light by luminescence conversion. They combined a blue emitting GaN LED with an organic dye or an inorganic phosphor, emitting at longer wavelengths, to synthesise white light by additive colour mixing.</u> Peter Schlotter, a member of the IAF research team, points out a further advantage of the new luminescence conversion LEDs (LUCOLEDs): "LUCOLEDs allow to extend the range of colours emitted by LEDs to whatever colour is required, depending on which conversion dyes or phosphors are used. Even purple light, which is impossible to be generated by conventional LEDs, can be emitted by LUCOLEDs." <u>For the invention of the single chip white emitting LED the research team at the IAF was awarded the 1997 Fraunhofer Prize</u>.**
>
> **This <u>simple but innovative and lowcost process, developed in close cooperation with Siemens AG, will enable mass production of white emitting LEDs</u>. Siemens plans to start up production of white light single chip LEDs in 1998."** (emphasis added)

The Fraunhofer/Nichia effort would have been a monumental success except for one fundamental fact.

At the time this breakthrough was announced, the applicants' parent application, U.S. Patent Application No. 08/621,937, was in its second year of PTO pendency.

The present inventors had won the race to solve the problem of getting white light from a single LED. Because of the secrecy in which U.S. patent applications are preserved, the world did not yet know this fact. The Fraunhofer publicity effort lauded the innovation and breakthrough achievement of the Fraunhofer scientists. The applicants however had been first to achieve white light output from a single LED, a genuine breakthrough that dramatically left behind "triplet" technology and the costs, fabrication issues and operational complexity of RGB arrays.

The race to produce a white light LED was waged in R&D labs throughout the world, by the brightest talent, and consumed millions of dollars. Its apparent winners were lauded in scientific and trade journals, and awarded prestigious prizes for their apparent victory. How, then, could applicants' *prior* conception and reduction to practice of their claimed invention be characterized as obvious to one of ordinary skill in the art?

The answer is that the applicants' claimed invention is not obvious. It represents a genuine innovation that merits allowance of the presently pending claims.

<u>The Examiner's Current Position - June 26, 2007 Office Action and Interview Summary</u>

In the June 26, 2007 Office Action, the examiner stated his position as follows:

> "... the phosphor disclosed by the instant application may be different than that of the phosphor disclosed by Stevenson. However, the claim language fails to claim such differences. Thus, it appears that the Applicant argues that the references fail to show certain features of applicant's invention, it is noted that features upon which applicant relies (i.e., the differences of phosphor or LED structure) are not recited in the rejected claim(s)."
>
> "...the combination of Stevenson, Kitagawa and Tadamoto produce the same results as claimed. Therefore such phosphor white light conversion is well known in the art. Something that is old does not be compatible upon the discovery of a new property. The claiming of a new use, new function or unknown property, which is inherently present in the prior art does not necessarily make the claim patentable."

The examiner at the conclusion of the August 20, 2007 USPTO interview with the undersigned attorney issued an interview summary stating that:

> "the issue of Stevenson in combination with the prior art of record **would not be the meaning to one ordinary skill in the art [sic] of the teaching of Stevenson in col. 3 and 4, but rather the phosphor and LED of Stevenson and others are capable of producing the same function as claimed.**" (emphasis added; August 20, 2007 Office Action).

The examiner by such statement has adopted a "capability" standard of patentability, which nowhere exists in USPTO procedure, decisions of the Board of Patent Appeals and Interferences,

or any judicial decisions. Further, the examiner has stated that the meaning of the teaching of Stevenson to one of ordinary skill in the art (the "artisan") is irrelevant. The examiner therefore has grossly departed from norms of USPTO practice, in disregard of fundamental and established principles of examination. See, for example, MPEP 706.02:

> "The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. 'To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to **why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references**.' *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985)."

This passage of the MPEP makes clear, contrary to the position taken by the examiner, that the meaning accorded to the teachings of the references by the skilled artisan is determinative ("why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.").

Here there is no express or implied suggestion of producing a white light output in Stevenson or the other references of record, and the examiner must accordingly present a convincing line of reasoning, which the bare assertion of "capability" does not satisfy. See also *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) ("there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness"), cited with approval in *KSR Int'l v. Teleflex Inc.*, 127 S.Ct. 1727 (2007).

Stevenson, in the paragraph bridging columns 3 and 4 thereof, simply mentions "phosphors" without disclosing what kind of phosphor. This paragraph of Stevenson does not contain any mention of a white light output, as required by applicants' claims, but simply speaks of generating primary colors - i.e., red, green or blue. Since there is no mention of any composition of such "phosphors" - no mention of whether they contain zinc, sulfur, cadmium, silver, copper, aluminum, chlorine, gold, yttrium, silicon, oxygen, gadolinium, europium, magnesium, manganese, cerium, gallium, indium, boron, fluorine, tungsten, lithium, thalium, barium, calcium, strontium, vanadium, germanium, or any other of the numerous elements creating different host and activator compositions - there is correspondingly no

correspondingly no basis for any color production other than what is specifically addressed, namely, primary colors (red, green and blue).

Applicants' pending claims 31-38 and 43-52, requiring radiation "to be emitted ...as a white light output," therefore finds no derivative basis in Stevenson, or any of the other art cited by the examiner.

CONCLUSION

Based on the foregoing, all of Applicants' pending claims 31-38 and 43-52 are patentably distinguished over the art, and in form and condition for allowance. The examiner is requested to favorably consider the foregoing, and to responsively issue a Notice of Allowance. If any issues require further resolution, the examiner is requested to contact the undersigned attorney at (919) 419-9350 to discuss same.

Respectfully submitted,

Vincent K. Gustafson
Reg. No. 46,182
Attorney for Applicants

**INTELLECTUAL PROPERTY/
TECHNOLOGY LAW**
Phone: (919) 419-9350
Fax: (919) 419-9354
Attorney File No.: 4241-198-CON

Enclosures:
Credit Card Payment Form PTO-2038 authorizing $1,270.00 [1 pg.]
Request for Continued Examination Form [1 pg.]

The USPTO is hereby authorized to charge any deficiency or credit any overpayment of fees properly payable for this document to Deposit Account No. 08-3284